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ABSTRACT

This practicum was designed to provide a means for students in the graduate education program at Nova Southeastern University (Florida) to demonstrate that they can successfully incorporate Internet information and communication technologies into teaching and professional development. Goals were: (1) to develop a means for assessing attainment of technological competencies applied to teaching; (2) to establish baseline competencies for Internet technology competencies for graduate education students; and (3) to map the integration of technology in the curriculum based on the International Society for Technology in Education (ISTE) standards. The solution involved three approaches. The first was to develop a Web-based course on using the Internet for teaching in which students created electronic portfolios to demonstrate technology competencies. In addition, the Web-based instruction course was adapted for an inservice Internet workshop for teachers from the Catholic diocese schools. Second, a self-assessment survey of Internet skills was administered to all incoming graduate education students and to the inservice teachers. Third, a course matrix was developed to chart the inclusion of technology competencies in each course. All students in the Web-based course developed and demonstrated specified technology competencies through course assignments and their electronic portfolios. The profile of Internet skills from the self-assessment survey indicated widespread experience for both students and inservice teachers with e-mail and general Internet searching, but minimal experience with creating Web pages or electronic portfolios or with using Internet resources for teaching. Similarly, the course matrix maps for graduate education courses showed that the application of technology to instruction was reported less frequently than other competencies. Appendices contain an outline for an electronic portfolio workshop, an agenda from an internet workshop for teachers, a checklist, and both a self-assessment and an assessment for teachers. (Contains 62 references and 17 tables.) (Author/AEF)

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Documenting Internet Technology Competencies of Graduate Education Students Through Web-based Instruction and Electronic Portfolios

By
Sharon Mader
Cluster 2

A Practicum Report Presented to
The Ed D. Program in Instructional Technology and Distance Education
In Partial Fulfillment of the Requirements
For the Degree of Doctor of Education

S. Mader

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ABSTRACT

Documenting Internet Technology Competencies of Graduate Education Students Through Web-based Instruction and Electronic Portfolios. Mader, Sharon, 1999: Practicum Report, Nova Southeastern University, Ed.D. Program in Instructional Technology and Distance Education. Internet/World Wide Web/Electronic Portfolios/Preservice Teacher Education/Teacher Competencies/Computer Uses in Education

This practicum was designed to provide a means for students in the graduate education program to demonstrate that they can successfully incorporate Internet information and communication technologies into teaching and professional development. Goals were: 1) to develop a means for assessing attainment of technological competencies applied to teaching; 2) to establish baseline competencies for Internet technology competencies for graduate education students; and 3) to map the integration of technology in the curriculum based on the International Society for Technology in Education (ISTE) standards.

The solution involved three approaches. The first was to develop a Web-based course on using the Internet for teaching in which students created electronic portfolios to demonstrate technology competencies. In addition, the Web-based instruction course was adapted for an inservice Internet workshop for teachers from the Catholic diocese schools. Second, a self-assessment survey of Internet skills was administered to all incoming graduate education students and to the inservice teachers. Third, a course matrix was developed to chart the inclusion of technology competencies in each course.

All students in the Web-based course developed and demonstrated specified technology competencies through course assignments and their electronic portfolios. The profile of Internet skills from the self-assessment survey indicated widespread experience for both students and inservice teachers with email and general Internet searching, but minimal experience with creating Web pages or electronic portfolios or with using Internet resources for teaching. Similarly, the course matrix maps for the graduate education courses showed that the application of technology to instruction was reported less frequently than other competencies.

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Chapter 1: Introduction

Description of Community

The community setting is a large city in the southern United States that rises on the bluffs above a major waterway. With a three-state metropolitan population of over 1,000,000, the community is the largest urban center within a radius of several hundred miles. The combined city and county land area covers 256 square miles, with the suburbs spreading many miles to the east. The population is split almost equally between black and white. While the heterogeneity of the population is less varied than would be found in urban Northern cities, the number and variety of ethnic groups is growing.

The main economic strength of the community is its role as a distribution center and transportation hub. It is the site of the busiest cargo airport in the world. Tourism is another strength; the city attracts tourists from all over the world who are drawn by its historic roots as the birthplace of blues and rock and roll. It also serves as a medical center for the entire Mid-South region, with a number of general and specialized hospitals and the university medical and health sciences schools.

The community has a large and diverse urban public school system, and an extensive collection of private K-12 schools, many of which have religious affiliations. There are 12 postsecondary institutions, including a community college, a technical institute, one large state university, a college of art, two graduate theological schools, several health sciences schools, and four private colleges. In general, they address the needs of different audiences, although the competition for students, especially for adult students, has become more evident in recent years. Four higher education institutions offer teacher education programs, and three of these have graduate programs in education.

Writer's Work Setting

The work setting is a small Catholic university that focuses primarily on preparing students for professional careers. The mission statement of the organization is to emphasize excellence in teaching and individualized attention to the whole person in a values oriented, inter-faith educational community. The University prepares students for professional careers and advanced study in the arts, sciences, business, and engineering and for lives of moral responsibility and constructive community involvement. In a city which has both a large state university and a well-regarded liberal arts college, the writer's institution attracts students because of its dedication to good teaching, personal attention to students' individual needs and talents, and a reputation for being technologically advanced.

The enrollment of the university is approximately 1800 students. Undergraduate students number around 1100. The total staff numbers 263, which includes 107 full-time faculty. The university is composed of four distinct schools: Arts, Business, Engineering, and Sciences. The 35-acre campus is located in the heart of the old established residential section of the city, which is also the neighborhood for coffee houses, art galleries, antique shops, and a preferred area for young professional and college-age professional people to live. The university recently established an extended campus site in a prime suburban area, in response to the recent appearance of satellite campus programs from other local and outside colleges and universities.

There are four graduate programs (MBA, Executive MBA, Engineering Management, and Education). The graduate teacher education program is the newest, having been established in the summer of 1997. The main local competition from other

institutions is the graduate program at the state university. Many of the students entering the program are changing from another career field to enter teaching. Initial enrollment in the new graduate education program for fall 1997 was 41 students and for spring 1998, 54 students. Enrollment for fall 1999 has grown to 154 students. The Education Department has three full-time faculty members and at least nine adjunct faculty. A fourth full-time position was added for 1998-99. The teacher education program has good working relationships with both the public and parochial schools in the city and the county.

Writer's Role

As Director of the Library, the role of the writer is to manage the acquisition and provision of research resources and services for students and faculty. In addition, since the primary mission of the library is to support and enhance learning, the writer teaches classroom sessions on information literacy and research skills for courses across the curriculum.

The writer supervises a staff of one part-time and six full-time employees and a staff of 20-25 student workers. The writer is responsible for a library budget of over $400,000. As a senior manager, the Library Director is a member of the Academic Council, which is composed of the deans and the Academic Vice-President.

In addition to the role of Library Director, the writer holds the rank of Associate Professor in the Education Department and teaches courses in the graduate education program. The writer is also a member of the Graduate Education Program Advisory Board, which provides guidance for the development and assessment of goals, structures, and achievements of the program. The Board includes representatives from city and county schools, area independent schools, the Catholic diocese, and the university.

Chapter II: Study of the Problem

Problem Statement

The problem addressed in this practicum was that students in the graduate teacher education program were unprepared to demonstrate that they can successfully incorporate new information and communication technologies into teaching and professional development.

Problem Description

Although the use of the Internet and other interactive technologies has been increasing in K-12 settings, the graduate teacher education program was not structured to provide the necessary foundation for students to confidently and competently use technology as an integral part of the learning process in their teaching positions. Students were not required to demonstrate attainment of technological competencies applied to teaching and learning. No baseline competencies were established and there was no means of assessing student attainment of competencies. Technology competencies were not integrated into the curriculum. The teacher education faculty needed more expertise to effectively model how technology can be integrated into the curriculum.

Problem Documentation

A self-assessment survey of Internet skills, designed by the writer, has been administered to all incoming graduate Education students by the Education Department since fall 1997 (see Appendix A). The purpose was to determine student access to computer resources and their initial level of skill in using Internet and computer communication resources.

Survey results for the period from fall, 1997 through summer, 1998, indicated that while most students had some experience with computers and with using the Internet, they had very little experience with using Internet resources in a teaching situation and almost no experience with creating Web pages. Responses confirmed that access to computers was not a problem but use beyond email and basic Web searching was not the norm. Of the 51 students surveyed, 36 had a computer at home. Even if they didn't have a computer at home, most had access to a computer at work or elsewhere. Only one-quarter of the students already had a university computer account. Of the information technology uses listed, those most frequently used by the students were Internet search engines and email. Students indicated an average level of comfort as Web navigators, but not many had used Internet resources for teaching, and almost everyone rated their skills in creating Web pages as non-existent (see Tables 1, 2, and 3 for a summary of results).

Table 1

Computer Resources Available to Incoming Graduate Education Students (1997-1998)

Computer Resources	Students (n=51)
Access to computer at work/elsewhere	43
Access to the Internet	38
Computer at home	36
Modem and dial access	26
University Computer account	14

Table 2

Use of Information Technology Reported by Incoming Graduate Education Students (1997-98)

Information Technology Tools	Number of students reporting use (n=51)
Internet search engines	37
Email	33
Web browsers	29
ERIC education database	23
Chat sessions/online conferences	13
Bulletin boards/listservs	12
File transfer (FTP)	5

Table 3

Self-Assessment of Internet Skills by Incoming Graduate Education Students

Information Technology Skill/Knowledge	M
Ability to do Internet subject searches	3.22
Comfort navigating the Web	2.96
Rating of Internet skills	2.78
Ability to cite Internet resources in a research paper	2.62
Use of Internet resources for teaching	1.94
Ability to create a Web page	1.3

Note The mean was calculated from responses on a scale of 1 to 5 (lowest to highest)

Other than individual course grades, technology competencies of graduate students are not assessed systematically as they progress through the program. Review of the program materials, university requirements, and faculty interviews were the means used to determine the level of assessment being used at present.

An inventory of the hardware and software available in the Education Curriculum lab and the other university computer labs was conducted. Standard applications software for word processing, spreadsheets, and presentations were available, as well as examples of educational software such as Kidpix®. These technology resources being used in the Graduate Education program were compared to what teachers might be expected to use in practice. While a variety of information technologies and software was available at the university, students in the graduate education program were not experiencing an adequate or sustained level of real-life experience with technology in the curriculum that would be equivalent to what is actually being used with K-12 students today.

Students were required to make "professional presentations" to an audience of faculty and students as part of the graduation requirements, but there was no requirement or encouragement to use technology for the presentation. A review of Graduate Education Office records was the source used to determine the extent of technology use for the professional presentations.

The state licensure requirements, which have just been revised and will go into effect in 2001, establish new requirements for preservice teacher technology competencies that are based on the Foundations Standards from the International Society for Technology in Education (ISTE, 1993). However, there was no plan for how the graduate education program will address these requirements to meet state standards. This

conclusion was based on interviews with the faculty member responsible for licensure and with the visitation team members from the state Department of Education who were reviewing the compliance of the new graduate program with current state requirements.

Although the stated goals of the Graduate Program in Education include the intent "to prepare teachers who skillfully use educational technology to enhance learning and manage instruction," there was no curriculum plan or sequence of courses to accomplish this goal and there was no means for assessing such a technology competency. A review of program goals, course descriptions, and departmental communications through faculty meetings confirmed this observation.

The teacher education faculty were not effectively modeling how to integrate technology into the curriculum. For example, of the four courses offered during the Fall 1997 semester, only one (taught by the writer) provided hands-on experience in technology that can be used in the K-12 curriculum and for professional development, one other course provided hands-on experience in searching electronic databases for research, the third course included a class discussion session on "Technology and the Curriculum," and the fourth course had no technology component at all. Course requirements and syllabi were reviewed to determine how technology was used in the curriculum.

Teacher education faculty were not provided with professional development opportunities to improve their technology skills for teaching, either by the department or the university. Interviews with faculty and the program director confirmed the lack of faculty development opportunities. The one exception was the technology training series offered by the Information Technology Group for faculty, staff, and students. However,

these workshops address applications such as Microsoft Excel® or Microsoft Access® rather than how to use technology for teaching.

Causative Analysis

The causes of the problem derived largely from issues of assessment, curriculum planning and design, and teacher preparation and skills. There were no benchmarks or standards for assessing students' technology competencies, even though the state has technology requirements for certification/licensure. The teacher education program at the University had not been revised to reflect new national, state, and content-area technology standards, even though many other teacher education programs have adopted new approaches to meet these challenges.

The teacher education curriculum was not designed or organized to support the integration of technology, and technology components in the courses were not tracked or required. The one introductory technology course, although required, was not coordinated with the other courses, especially the methods courses, so that students did not have the opportunity to apply educational technology to teaching practice. While a constructivist approach of student-centered learning and self-reflection is espoused as part of the program philosophy, it was not used as a basis for teaching with technology.

While many students in the program have no previous teaching background, even those who were already teachers had little or no experience using technology, especially Internet resources, in teaching. The graduate education program did not provide technology equivalent to what was actually being used in K-12 schools, and examples of exemplary K-12 computer-using teachers were not provided.

In general, the teacher education faculty were not prepared to model appropriate and current uses of technology in the K-12 curriculum, due to lack of training, prior experience, professional development opportunities, and university support and incentives. In spite of this need, the technology skills of the teacher education faculty were not kept up-to-date through professional development opportunities.

Relationship of the Problem to the Literature

The topic areas researched for the literature review included computer literacy, computer uses in education, educational technology, computer attitudes, preservice teacher education, and teacher education curriculum. Databases searched were ERIC and Dissertation Abstracts databases. Keyword searches of the Web were also conducted.

There is a growing discrepancy between the expectations and demands for technology in schools and the realities of teacher knowledge and skills. While K-12 schools are being equipped with computers and other instructional technologies, the impact on teaching and learning has been limited because both new graduates and veteran teachers do not know how to use them (Fox, Thompson, & Chan, 1996; Kopp & Ferguson, 1996; National Council for Accreditation of Teacher Education, 1999). Technology literacy has been identified as a target area for Goals 2000 school improvement reforms, but teacher education programs have not made this a priority for their curricula (Bitter, et al., 1997).

Reviews of preservice teacher education programs indicated that they do not adequately address how to prepare teachers to use technology (Beaver, 1990; Brooks & Kopp, 1989; Falba et al., 1997; Northrup & Little, 1996; Office of Technology Assessment, 1995; Roblyer, 1996). Teacher education students may be learning about

technology, but they are not learning with technology (Faison, 1996; Handler & Strudler, 1997).

Surveys of practicing teachers indicated that they felt that they were not adequately prepared by their educational program to use technology in their teaching (Beaver, 1990; Faison, 1996; Northrup and Little, 1996; Topp, 1996). A survey of recent graduates showed that 67% of respondents rated their preservice teacher preparation for using technology in teaching as inadequate (Topp, 1996).

One of the causes for this failure of teacher education programs to produce technology-using teachers is that benchmarks and standards have not been widely used in teacher education programs to assess the achievement of technology competencies (Friske, Knezek, Taylor, Thomas, & Wiebe, 1996; Handler & Strudler, 1997; Northrup & Little, 1996; Taylor & Wiebe, 1994). Students cannot demonstrate attainment of competencies if they have not been defined and actively used. This lack of standards contributes to the discrepancy between teacher education and teacher practice, since standards-based education is becoming prevalent in K-12 education.

Prior to the introduction of the ISTE Foundations Standards in 1992 (ISTE, 1993), there were no benchmarks for assessing technology competencies that should be a part of all teacher preparation programs. However, effective use of these benchmarks is still evolving, and they need to be more universally and uniformly adopted by teacher education programs (Friske, Knezek, Taylor, Thomas, & Wiebe, 1996; Handler & Strudler, 1997; Northrup & Little, 1996; Taylor & Wiebe, 1994. Teacher educators are being forced to rethink and revise their curricula in light of the growing prominence of the

ISTE Standards for technology (Friske, Knezek, Taylor, Thomas, & Wiebe, 1996; Kahn, 1997; Levin, 1996).

Another cause of the poor preparation for teaching with technology is that the structure of the teacher education curriculum does not facilitate this goal. Many teacher education programs cover educational technology in a single course. However, there is a consensus in the literature that this stand-alone course structure does not provide adequate preparation for students to apply technology in other courses or in actual teaching practice. A course in educational technology is not required for a teaching license in approximately one-third of the states (Educational Testing Service, 1996; Fox, Thompson, & Chan, 1996; Handler & Strudler, 1997).

Even if an introductory educational computing course is offered, it may not be a prerequisite. In addition, such a course is not generally integrated with the rest of the curriculum. Students may not have opportunities in any other course or fieldwork to apply what they learned to a teaching context (Educational Testing Service, 1996; Fox, Thompson, & Chan, 1996; Handler & Strudler, 1997). A survey of recent graduates from a teacher education program at a large midwestern university showed that the majority felt an educational computing course should be a requirement for undergraduate education majors, but they also thought that students should learn how to integrate computers across the curriculum, with technology being an integral part of methods courses and field experiences (Topp, 1996).

The integration of technology into the curriculum and the direct experience with methods and materials used in today's classrooms are essential ingredients for adequate teacher preparation. New teachers will be required not only to teach with technology, but

also to move from a traditional mode of instruction toward new methods of cooperative learning, constructivism, and learner-centered instruction which integrate technology (Bitter, et al., 1997; Jin & Willis, 1998; Niederhauser, 1996; White, 1996). Integration of technology is not generally included in the field experience and preservice teachers do not have enough exposure to exemplary computer-using teachers at the K-12 level (Holt, Ludwick, & McAllister, 1996; Office of Technology Assessment, 1995). Schools of education do not always have the lab facilities, software, and network capabilities to provide the necessary hands-on experience for preservice teachers (Northrup & Little, 1996).

A key cause for the students' inability to demonstrate technology competencies is that the teacher education faculty themselves do not have the necessary knowledge and skills. In general, students do not have adequate models for the integration of technology into the curriculum (Clawson, 1996; Levin, 1996; Northrup & Little, 1996). While there may be faculty who specialize in teaching the educational technology courses, faculty who teach methods courses may not be prepared to teach with technology (Levin, 1996). Teacher education faculty are generally not prepared to model and employ performance-based assessment which is becoming the norm in K-12 schools and which is essential for demonstrating technology competencies (Griffith, 1995).

Many teacher education faculty are not prepared to use technology in the curriculum because their graduate school preparation and their teaching experience predated the introduction of technology (especially the Internet) into the classroom (Office of Technology Assessment, 1995). However, this need is not being remedied by many colleges and universities, since teacher education faculty are not provided with adequate

professional development opportunities to learn to teach with technology (Beaver, 1990; Faison, 1996; Niederhauser, 1996; Northrup & Little, 1996; Office of Technology Assessment, 1995).

The review of the literature indicates that the problems identified in the writer's work setting are mirrored in teacher education programs around the country. Students graduating from teacher education programs feel unprepared to deal with the expectations and realities of teaching with technology that they will face on the job. Teacher education faculty are struggling to acquire the expertise to effectively model teaching with technology. Since standards for technology competencies have not been adopted, it is not possible to assess student attainment of competencies. While students may take one educational technology course, technology is not integrated into the curriculum to provide a meaningful and authentic foundation to model effective teaching with technology.

III. Anticipated Outcomes and Evaluation Instruments

Goals and Expectations

Students in the graduate education program will demonstrate attainment and development of a range of technological competencies that will serve as resources for teaching and for continuing professional development.

Expected Outcomes

The following outcomes were projected for this practicum:

1. At least twelve of fifteen students enrolled in the Web-based Instruction course will demonstrate their ability to use email and Web-based communication technologies for classroom instruction and professional development.
2. At least twelve of fifteen students enrolled in the Web-based Instruction course will demonstrate their ability to conduct effective searches of the Internet and of the ERIC database to find education research and resources for classroom instruction and professional development.
3. At least fourteen of fifteen students enrolled in the Web-based Instruction course will demonstrate their ability to critically evaluate, select, and incorporate Internet resources into a lesson plan for a chosen K-12 subject area.
4. At least twelve of fifteen students enrolled in the Web-based Instruction course will demonstrate competency in using multimedia and hypermedia for classroom instruction.

5. At least twelve of fifteen students enrolled in the Web-based Instruction course will demonstrate knowledge of the ethical, legal, and social implications of technology use in education.
6. At least ten of fifteen students enrolled in the Web-based Instruction course will be able to match their portfolio self-evaluation scores with scores provided by their peers and the instructor, using the portfolio rubric.
7. At least twelve of fifteen students who complete the Web-based Instruction course will indicate on the attitudinal survey that they prefer authentic assessment to traditional assessment.
8. At least ten of fifteen students who complete the Web-based Instruction course will document continuing development of technology competencies in subsequent courses.
9. The number of graduate education students using an electronic portfolio for their required professional portfolio presentations will increase from zero to at least four.
10. The integration of technology into the graduate education curriculum will be evident in at least four of seven courses each semester.
11. At least one of three full-time faculty and three of nine part-time faculty will document that they are modeling effective technology use for students in their courses.
12. The number of professional development workshops on teaching with technology offered for graduate education faculty (both full- and part-time) will increase to at least one workshop per semester.

13. The number of full- and part-time graduate education faculty using electronic portfolios for classroom instruction and professional development will increase from zero to at least four.

Measurement of Outcomes

Four primary evaluation instruments were developed by the writer to measure the outcomes: 1) the Self-Assessment of Internet Skills (see Appendixes A and B); 2) the Electronic Portfolio Rubric (see Appendix C); 3) the Attitudinal Survey (see Appendix D); and 4) the Course Matrix (see Appendixes E and F). In addition, the assignments completed by students for the writer's Web-based course (MED621) were also used for assessment.

For Outcomes 1-6, the self-assessment survey, the electronic portfolio rubric, and course assignments were used as evaluation measures. Students completed the self-assessment survey of Internet skills at the beginning and end of the fall 1998 course (see Appendix B). This survey was also given to all students entering the graduate education program. The writer developed the instrument to gather baseline data when the graduate education program began in fall 1997, which also coincided with the proposal writing phase. The instrument was modified at the beginning of the second program year (fall 1998) to conform more closely to the ISTE *Foundations Standards*. The survey design uses a Likert-like scale for students to rate their level of experience or skill with a range of technological competencies.

The survey instrument has three sections. Section I (questions 1-5) covers availability of computer hardware and access at home, school, and work; Section II (question 6) measures use of six kinds of Internet communications and information tools

and resources; and Section III (questions 7-16) measures Internet skill level and experience in ten areas.

These areas correspond to the International Society for Technology in Education (ISTE) *Foundations Standards*. The second edition of the *Curriculum Guidelines* (ISTE, 1993) identified thirteen competencies, while the third revision (ISTE, 1998) combined these into three areas (Basic Computer/Technology Operations and Concepts, Personal and Professional Use of Technology, and Application of Technology in Instruction).

The students and the instructor assessed student electronic portfolios at the end of the MED 621 course using the electronic portfolio rubric (see Appendix C). This second version of the rubric was developed during the fall 1998 course. Initially, the writer had developed a portfolio rubric that rated the portfolios based on each of the thirteen ISTE technology competency areas. However, it became clear during the fall course that a different format was needed for realistic assessment of web page creation.

Student attitudes towards the experience of authentic assessment (Outcome 7) was measured by a written attitudinal survey (see Appendix D). The survey was administered to the students at the end of the Web-based course, after their final conference with the instructor.

For Outcome 8, the evaluation measure used was student documentation through their portfolios of competency attainment in the semester following the Web-based Instruction course. For Outcome 9, the evaluation measure used was the number of graduate students who used electronic portfolios for their professional presentations. When the practicum began, students were to make presentations after every nine hours of

credit. Then the requirements were changed so that professional presentations are to be done at the end of the program.

The evaluation measure used to monitor the integration of technology in the graduate education program (Outcome 10) was the course matrix (see Appendix E and Appendix F). The matrix matches course content with the ISTE Foundations Standards. Two different versions were used for fall and spring semesters because of a revision in the ISTE Standards. At the end of the semester, faculty filled out a matrix for each course they taught to chart which competencies are covered. For the spring semester, students also filled out a course matrix to record which technology concepts and skills were covered, and these results were compared.

Chapter IV: Solution Strategy

Discussion and Evaluation of Solutions

The problem addressed by this practicum was that students in the graduate teacher education program were unprepared to demonstrate that they could successfully incorporate new information and communication technologies into teaching and professional development.

Topic areas researched for the literature review included teacher education, preservice teachers, computer literacy, technology competencies, computer uses in education, assessment, and portfolios. Information searches were conducted in the ERIC and Dissertation Abstracts databases, as well as the *WorldCat* database of monographic literature. Possible solutions that emerged are outlined here.

For students to demonstrate attainment of technology competencies, the competencies have to be defined. Some institutions have done extensive work in developing their own technology training benchmarks, using national, state, and content-area standards as guidelines (Northrup & Little, 1996). The teacher education program at the writer's institution only had three full-time faculty members and the idea of using technology standards as benchmarks had not been explored at this point.

The ISTE Foundations Standards can be used effectively to provide a list of competencies that are needed by all teachers and to serve as a baseline for integrating technology into teacher education programs (Burke, 1998; Friske, Knezek, Taylor, Thomas, & Wiebe, 1996; Handler & Strudler, 1997; Office of Technology Assessment, 1995). The teacher education program at the writer's institution had not used the ISTE

Foundations Standards (or any other standards) to assess student performance or to implement any changes in the curriculum, although many other teacher education programs have done so.

After identifying competencies, the next step is to develop an effective method of assessing these competencies. Methods for documenting and assessing student progress vary, depending in part on the knowledge and skills to be measured. Portfolios are being used successfully to document and assess the attainment of competencies, including technology. This method of authentic assessment is being used regularly with K-12 students and is now being adopted as a valid and valuable approach for preservice and practicing teachers (Dutt-Doner & Personett, 1997; Freidus, 1996; Lankes, 1995; Levin, 1996; Mathies, 1994; McLaughlin & Vogt, 1996; Meyer & Tusin, 1999; Richards, 1998; Ryan, Cole, & Mathies, 1997; Tancock & Ford, 1996; Task Force on Field Experience Standards, 1998; Wilcox, Tomei, & Manner, 1997). There was no method in place at the writer's institution to document and assess the technology competencies of students at their entrance or at graduation.

Portfolios can be tied to specific standards or competencies (Levin, 1996), or the parameters may be defined by the students, the instructor, or collaboratively, without external standards (Backer, 1997; Mathies, 1994; Ryan, Cole, & Mathies, 1997; Siegmann, 1998; Tancock & Ford, 1996; Wilcox, Tomei, & Manner, 1997). The format for portfolios can be written or electronic, or a combination of both. There are pedagogical, technical, and institutional considerations in deciding which medium to use (Barrett, 1998; Moersch & Fisher, 1995; McKinney, 1994). The writer's university has the technical capabilities for students to create electronic portfolios and mount them as

Web pages on the university server. This approach has advantages over a written format in terms of revision and storage over time and the capacity for sharing with peers, instructors and other audiences.

The structure of the teacher education program affects how students learn about technology. Different curriculum designs are used to provide education students with the technological preparation they need. One traditional approach has been to offer a separate instructional technology course, either required or as an elective, which should be taken before methods courses (Beaver, 1990; Cimikowski & Cook, 1996; Handler & Strudler, 1997; Northrup & Little, 1996; Topp, 1996). At the writer's institution, one general educational computing course was required as part of the graduate education core, but it was not required at the beginning of the program nor were the skills reinforced in other courses. This has since changed, and students choose one of the technology courses to fulfill the requirement. In addition, the skill level of the students varied greatly, so that neither the entry level or advanced level students were well served. For these reasons, this solution had not been successful in providing the necessary technological preparation.

Another approach, which is becoming more popular, is to integrate technology throughout the curriculum in a variety of ways. A totally integrated curriculum can be designed to incorporate model lessons and activities into specific courses. An integrated curriculum can be used to establish K-12 partnerships to provide technology-rich settings for student interns. As another approach, an integrated curriculum can be a means of providing hands-on experience with a variety of software and technology used in schools (Clawson, 1996; Faison, 1996; Farenga & Joyce, 1996; Fox, Thompson, & Chan, 1996;

Handler & Strudler, 1997; Holt, Ludwick, & McAllister, 1996; Kahn, 1997; Office of Technology Assessment, 1995; White, 1996).

A new approach to curriculum integration is to provide online courses as a means of engaging students in the technology (Boettcher & Cartwright, 1997; Peterson & Facemeyer, 1996). The School of Engineering at the writer's institution offered an online course in summer of 1998, and this approach was one that the Education Department could explore to make the graduate program more accessible and convenient for working adults, as well as to provide authentic experiences with interactive technologies.

If teacher education faculty are unprepared to deal with technology, then their students will be unprepared as well. It is essential that teacher education faculty model appropriate uses of technology (Beaver, 1990; Handler & Strudler, 1997; Levin, 1996; Office of Technology Assessment, 1995; Topp, 1996). The graduate education faculty at the writer's institution had an uneven level of technological expertise and thus only a few were able to model appropriate uses of technology.

To provide education students with the necessary preparation to teach with technology, education faculty will also have to be provided with training and development opportunities. Some programs have devoted extensive resources to inservice technology training, with standing committees, workshops, tutoring, and staffing (Barger & Armel, 1992; Beaver, 1990; Herman & Morrell, 1999; Northrup & Little, 1996; Office of Technology Assessment, 1995). In the writer's setting, no regular faculty development program for developing technological expertise existed in the graduate education program or even within the university.

Description of Selected Solutions

From the review of the literature and from discussion with colleagues and consideration of the unique conditions of the writer's setting, several directions appeared as viable solutions.

The use of technology standards for teachers presented a logical way to define and measure the technology competencies, as well as offering a link to similar work of educators and researchers around the country. Rather than trying to develop original standards, the ISTE Foundations Standards were used as a systematic means of assessing student competencies and as a guideline for technology integration.

The writer intended to have the graduate education students in the Web-based course create a web page to develop and illustrate their technology skills, but it was unclear exactly how to assess the technology competencies. From the literature review, portfolios were identified as a means of authentic assessment. In particular, reports of the use of electronic portfolios in teacher education were immediately appealing and offered the promise of addressing all three branches of the practicum problem: technology competencies, curriculum integration, and faculty development.

Instead of a single technology course, the approach of integrating technology across the curriculum was adopted. This process began with one course, the Web-based Instruction course taught by the writer. At the same time, the extent of technology integration was charted as a basis for future implementation. The inclusion of technology in each course in the Graduate Education Program was mapped using a course matrix. Faculty identified technology competencies included in each of their courses. The matrix used the ISTE Foundations Standards.

It became clear both from reflecting on the writer's setting and from reviewing the literature that the technology skills of the teacher education faculty have to be addressed and improved along with those of the students. This solution strategy was to be a part of the practicum, although not as a major focus. Initially, faculty documented how they used technology in their courses.

The solution implemented was to have graduate education students in the Web-based Instruction course create electronic portfolios. This approach allowed them to develop and demonstrate technological competencies that could be used in teaching with technology in K-12 settings, in continuing professional development, and in seeking employment.

The creation of electronic portfolios by students in the Web-based course provided a means to accomplish several projected outcomes: a) to provide a tool to develop students' technological competencies and self-assessment skills; b) to document the students' attainment of technological competencies as measured by national standards (the ISTE Foundations Standards); and c) to provide a tool that could be used by students in subsequent courses to document development of skills, knowledge, and attitudes not only in technology, but also in content areas.

The use of electronic portfolios provided a means of authentic assessment of student achievement. Portfolios promote a student-centered and constructivist learning environment by providing students with an opportunity to assume responsibility for their education, to learn valuable skills of self and peer assessment, and to gain a foundation for reflective practice.

The use of electronic portfolios can also provide an impetus for integrating technology into the teacher education curriculum. After the Web-based Instruction course, students can continue to use the portfolios to document technology competencies for subsequent courses. Students can also use electronic portfolios for their required professional presentations as a synthesis of what they have learned to date.

Report of Action Taken

During the practicum, the writer's primary activity was teaching the Web-based Internet for Instruction course (MED621) in the graduate education program (see Appendix H for course syllabus and modules). The course had been created by the writer and offered for the first time during fall semester, 1997, using a traditional classroom format but with a Web-based syllabus and course content. This course was revised to become a group independent study course for fall 1998. A combination of Web-based modules and in-class sessions was used. The students would meet as a group in face-to-face sessions once a month and work on the web-based modules individually and communicate electronically with the instructor and each other the rest of the time.

This was the first Web-based course to be offered by the Education Department. While courses in other departments use Web-based modules (e.g., English, Biology, and Electrical Engineering), no other course in the university has been offered in this distance format. Web-based instruction can be defined as "a hypermedia-based instructional program which utilizes the attributes and resources of the World Wide Web to create a meaningful learning environment where learning is fostered and supported" (Khan, 1997). This can be done within a traditional classroom format or through the distance format, in which the instructor and the students interact remotely.

The course objective was for students to develop specific information technology competencies, which were based on the ISTE *Foundations Standards*. Students in the MED621 course were introduced to the idea of creating an electronic portfolio to document their accomplishments in the graduate program, to use for their required professional presentation, and to use for continuing professional development. As their major course project, they were required to develop a web page that would serve as an ongoing electronic portfolio.

Although the practicum proposal had stated that the Hyperstudio authoring program would be used to develop the electronic portfolios, Netscape Composer was used instead because of the ready availability, shorter learning curve and ease of use. The students were introduced to Hyperstudio as one means of creating multimedia instructional modules, and they each created a four-card stack as part of an interactive Hyperstudio tutorial. Given a choice, the students all used Composer to create their web pages. They also created a simple page using HTML code.

Assessment of students' skill, knowledge, and attitudes was conducted at several points throughout the course. Students completed the Self-Assessment of Internet Skills survey at the beginning of the course (see Appendix B). At the end of the course they completed the Attitudinal Survey (see Appendix D) as well as the university-required instructor evaluation. As part of their final project, they completed an Electronic Portfolio Rubric to evaluate their own work (see Appendix C). The instructor also completed the same portfolio assessment for each student.

Since students are required to give a professional presentation at the end of the program, the writer decided to offer all graduate education students the opportunity to

learn to create electronic portfolios to document their accomplishments in the graduate program and to use as a non-traditional but effective format for their professional presentations. The writer designed an introductory workshop for any graduate education students who were interested in developing electronic portfolios (see Appendix I for workshop agenda).

To facilitate the next phase of development of the web-based course, the writer received approval from the University Network administrator to install WebCT, a course authoring software package, on the Unix server. The writer investigated several course authoring software packages and decided to use WebCT because of its low cost and ease of use.

A second set of planned activities during the practicum implementation involved developing a baseline profile of student information technology competencies through the self-assessment of Internet skills survey administered to all incoming graduate Education students (see Appendixes A and B). Data collection had begun in fall 1997, when the program officially began, and continued throughout the practicum.

The third major activity was mapping the current use of technology in the graduate education curriculum. A course integration matrix was used as the instrument (see Appendixes E and F). At the end of the fall 1998 and the spring 1999 semesters, faculty were asked to complete a matrix for each course they taught, indicating which technology competencies were used in their courses. The list of competencies was derived from the ISTE *Foundations Standards*. The course matrix used for spring 1999 was modified to reflect the latest revision of the standards (ISTE, 1998).

The fourth focus of the practicum was providing professional development activities for inservice teachers. The unexpectedly low enrollment in the Web-based graduate education course necessitated an expansion of the user population for the practicum. Thus, the writer initiated discussions with the Superintendent of the Diocese K-12 schools about using the "Internet for Instruction" Web-based course for inservice training for teachers in the Catholic schools. The proposal was received enthusiastically. The first workshop was conducted on April 30, 1999, with 17 participants representing 11 schools (see Appendix J for workshop agenda and accompanying Web page). The teachers' skills ran the gamut from technology leaders to those who didn't have a computer at school or at home. More sessions are planned for the next academic year.

The expectations outlined in the practicum proposal were not realized exactly as planned, due to a variety of unanticipated events. The original outcomes were predicated on having a normal size enrollment in the Internet course and also assumed a greater level of control over the program and the curriculum than the writer had as an adjunct faculty member outside of her normal power base.

The first unexpected event at the beginning of the practicum implementation was the reduction in the population size due to low enrollment in the writer's Internet for Instruction course (MED 621) for fall 1998. Only four students had registered, instead of the normal enrollment of 10-15 students. Normally, a course would be cancelled with less than six students.

The writer's response to this roadblock was to obtain approval to offer the course as a group independent study and to transform the face-to-face course to a Web-based format. The practicum outcomes had been predicated upon the interaction of a traditional

class and required the use of peer assessment and other group interaction. Thus, it was unclear what the effect of having a small number of students working mostly independently would have on the outcomes. Indeed, it proved to be more difficult to implement the Web-based course than anticipated, due to problems with student motivation and participation, and the extra development time demanded of the instructor.

The small number of students did not provide the interaction needed for the peer evaluation that had been planned. The course ended up with three students, one of the original four dropped out for personal reasons not related to the course. Two of the three students already had computer skills and were familiar with using an Internet browser. The course content and the distance format presented a challenge to the third student, who had very little computer experience or knowledge. None of the students had university computer accounts, so time had to be taken during the first class to obtain passwords and learn the rudiments of the system, since this was essential for the functioning of the course.

The writer's additional response to the reduction in population size was to identify another appropriate population (the Catholic diocese teachers) to participate. This unexpected revision in plans provided useful comparative data on Internet skill levels and professional development needs of inservice teachers.

A second unexpected aspect of the practicum implementation was that in attempting to make changes at several levels of the organizational system, the writer had underestimated the magnitude of the changes, as well as the timeframe, that was needed. Instead of focusing on a single outcome that would then lead to more systemic changes, the writer had proposed an unrealistic number of outcomes for the practicum.

In part the practicum outcomes were not realized as planned because the writer was operating outside of her normal power base as library director. Her intention for the practicum was to gain new knowledge and experience about teacher education and technology. However, the peripheral role as adjunct faculty member precluded involvement in curriculum discussions and decisions and made it more difficult to learn about changes in program goals, structure, and course enrollments.

The Graduate Education Program added student outcomes in the second year of the program. Graduates were to be self-directed learners, collaborative workers, complex thinkers, quality producers, community contributors, and educational leaders. While it would seem that technology could be part of each of these outcomes, it was only explicitly mentioned in the outcome of quality producer, where one of the performance indicators is that the student "uses technology to enhance the quality of performance." It was not clear how this would be implemented in individual courses or through the interplay of courses. While non-electronic portfolios were being used in the Graduate Education program, the use of electronic portfolios throughout the curriculum was not promoted outside of the writer's course.

The process of mapping technology in the curriculum was hampered by missing data. Completed course matrixes were not obtained from all the faculty. The use of the matrix had received general agreement and the approval of the director of the program during the presentations at both the spring 1998 and the fall 1998 faculty meetings. The approval of the director for the use of the course matrix was reconfirmed for the spring 1999.

In summary, the primary activities of the writer during the implementation of the practicum were teaching the Web-based Internet for Instruction course, developing a profile of graduate education student Internet and information technology competencies, and mapping the integration of information technology in the graduate education curriculum. The roadblocks encountered were those created by the writer, those created by interactions with others, and those that were an inevitable part of organizational structure and technological innovation. Each one provided a lesson that can be applied to future efforts.

Chapter V: Results

Results

The problem addressed in this practicum was that students in the graduate teacher education program were unprepared to demonstrate that they could successfully incorporate new information and communication technologies into teaching and professional development.

The goal of this practicum was for students in the graduate education program to demonstrate attainment and development of a range of technological competencies that would serve as resources for teaching and for continuing professional development.

The solution implemented was to have graduate education students in the Web-based Instruction course create electronic portfolios (see Appendix H for course syllabus and modules). This approach allowed them to develop and demonstrate technological competencies that will be useful in teaching with technology in K-12 settings, in continuing professional development, and in seeking employment. The technological competencies are based on the ISTE Foundations Standards.

The following outcomes were projected for this practicum:

Outcome 1. At least twelve of fifteen students enrolled in the Web-based instruction course will demonstrate their ability to use email and Web-based communication technologies for classroom instruction and professional development.

This outcome was not met.

The enrollment in the course did not meet the expectations. However, the three students who were enrolled in the course did demonstrate their ability to use email and the Web Bulletin Board through course interactions and assignments (Module 1 and Module

6, Lesson 2), and through their electronic portfolios. Students had prior experience with email but not with the WebBoard, as indicated in the self-assessment of Internet skills (see Table 4). The checklist of course assignments indicates the range of competencies covered (see Appendix L).

Table 4

Information Technology Experience Prior to and During the Web-based Instruction Course

	Students with experience	
Competency	Prior to course	During course
Email	2	3
Internet Searching	2	3
Multimedia/hypermedia	2	3
Ethical/legal/social aspects	2	3
Internet resource citation	1	3
Internet evaluation criteria	1	3
Internet in teaching	1	3
WebBoard	0	3
Web page creation	0	3
Electronic portfolio creation	0	3

Note. n=3

Outcome 2. At least twelve of fifteen students enrolled in the Web-based Instruction course will demonstrate their ability to conduct effective searches of the

Internet and of the ERIC database to find education research and resources for classroom instruction and professional development.

This outcome was not met.

The enrollment in the course did not meet the expectations. However, all three students enrolled in the course conducted effective searches using Internet search engines and directories and provided reflections on their search experience as part of Module 2, Lesson 1 (see Appendix L for assignment checklist). Searching the ERIC database was not included in the fall 1998 syllabus. Two of the three students reported on the initial self-assessment that they had used ERIC before and felt comfortable doing searches. In addition, searching the ERIC database is covered in the Educational Research course.

Outcome 3. At least fourteen of fifteen students enrolled in the Web-based Instruction course will demonstrate their ability to critically evaluate, select, and incorporate Internet resources into a lesson plan for a chosen K-12 subject area.

This outcome was not met.

The enrollment in the course did not meet the expectations. However, the three students who were enrolled in the course did demonstrate their ability to evaluate and select Internet resources and incorporate them into a lesson plan as part of their course work (Module 2, Lesson 2 and Module 3). According to the self-assessment of Internet skills, only one of the three students had prior experience with using Internet resources for teaching (see Table 4).

Outcome 4. At least twelve of fifteen students enrolled in the Web-based Instruction course will demonstrate competency in using multimedia and hypermedia for classroom instruction.

This outcome was not met.

The enrollment in the course did not meet the expectations. However, the three students who were enrolled in the course did demonstrate their ability to use multimedia and hypermedia. As part of Module 4, the students created a simple hypercard stack using the Hyperstudio tutorial. Because a Hyperstudio "lab pack" license for both PC and Mac was purchased for this course, the software is now available for students to use in the Curriculum Lab.

Students also created a Web page using Netscape Composer. The Web page was based on an electronic portfolio template. At the beginning of the course, none of the students had any experience with creating Web pages or electronic portfolios, according to the self-assessment instrument (see Table 4). Samples of the student web page projects can be found at http://www.cbu.edu/~smader/educ621/module5.html.

Outcome 5. At least twelve of fifteen students enrolled in the Web-based Instruction course will demonstrate knowledge of the ethical, legal, and social implications of technology use in education.

This outcome was not met.

The enrollment in the course did not meet expectations. However, students in the course were exposed to these topics through activities and discussion. Module 2 (Lesson 3) covers citing Internet sources. Students wrote a reflection on the reasons for proper documentation. Discussions of Web site evaluation criteria and the elements of safe surfing also provided a foundation for continuing awareness and appropriate use of Internet sources. Two of the three students already had some awareness of these issues, according to the self-assessment of Internet skills survey (see Table 4).

Outcome 6. At least ten of fifteen students enrolled in the Web-based Instruction course will be able to match their portfolio self-evaluation scores with scores provided by their peers and the instructor, using the portfolio rubric.

This outcome was not met.

While the students improved their technology competencies, the unanticipated changes in the format and size of the class meant that the process of self-evaluation that had been planned did not take place. The original plan was for students to assess their own portfolios at the mid-term and compare their assessments to assessments done by their peers and the instructor. Then, at the end of the course, the process would be repeated, and students could see if their self-assessments more closely matched those of their peers and the instructor. Instead, the students evaluated their own web pages, but there was no earlier interim evaluation or peer evaluation with which to compare the final evaluation. The writer also evaluated the student web pages at the end of the course. The instructor evaluations were almost identical to the student self-evaluations.

The original portfolio rubric (see Appendix G), which used the ISTE Foundations Standards as the basis for the technology competencies, proved not to be appropriate for the self-evaluation of the web pages. A new rubric was developed (see Appendix C) which assessed design and content standards and provided concrete criteria so students could determine their level of achievement.

Outcome 7. At least twelve of fifteen students who complete the Web-based Instruction course will indicate on the attitudinal survey that they prefer authentic assessment to traditional assessment.

This outcome was not met.

While the enrollment was smaller than predicted, two of the three students enrolled in the MED 621 course preferred being assessed through their electronic portfolio as compared to traditional means, according to the results of the attitudinal survey they completed at the end of the course (see Appendix D). On the instructor evaluation form required by the university, one student commented, "I loved the format! It was very satisfying to be given the source of information and emerge with a final project."

Outcome 8. At least ten of fifteen students who complete the Web-based Instruction course will document continuing development of technology competencies in subsequent courses.

This outcome was not met.

The measurement that was planned for this outcome was not feasible. However, one of the students has continued to develop and use her Web page both for other courses and for use with her own community college students. All three students indicated on the Attitudinal Survey (see Appendix D) that the portfolio process very definitely helped them to develop their technology skills.

Outcome 9. The number of graduate students using an electronic portfolio for their required professional portfolio presentations will increase from zero to at least four.

This outcome was not met.

The requirements and schedule for the professional portfolio presentations changed during the implementation. Rather than making a presentation after every nine credit hours, students now meet with faculty and only make the professional presentation at the end of their course work. In addition, the failure to disseminate electronic portfolio skills through workshops to the student population outside of the three students in the

MED 621 course meant that this outcome would not be realized over the short-term implementation schedule.

Outcome 10. The integration of technology into the graduate education curriculum will be evident in at least four of seven courses each semester.

This outcome was met.

The integration of technology was documented in six of nine courses during the fall 1998 semester and in five of eight courses in the Spring1999 semester. The Course Integration Matrix (see Appendixes E and F for the two versions) was used to measure the integration of technology into the curriculum.

For the fall 1998 semester, each of the six courses for which data was available included at least four competencies. Three courses included all thirteen competencies. Table 5 shows the number of competencies per course.

Table 5

Fall 1998 Graduate Education Courses Ranked by Inclusion of Technology Competencies

Course	Number of competencies covered (of 13)
Curriculum Development 610	13
Using Computers in Education 620	13
Using the Internet 621	13
Assessment of Learning & Practice 608	5
Educational Research 603	4
Analysis of Teaching 601	4
Legal, Ethical and Social Issues 606	Not available
Special Needs Students 630	Not available

Middle School Strategies 681	Not available

Note. The thirteen technology competencies are from the ISTE *Curriculum Guidelines* (1993).

The one competency included in all six courses was #12: "Uses computer-based technologies to access information to enhance personal & professional productivity." Competencies 1, 5, and 11, which were included in five courses, deal with basic computer skills, problem solving and information management skills, and staying current in the field. The rest of the competencies (2, 3, 4, 6, 7, 8, 9, 10, and 13), which are covered in only half of the courses, have to do with uses of technology in support of instruction. Table 6 shows the specific competencies included in each course for fall 1998.

Table 6

ISTE Competencies Included in Fall 1998 Courses

	Course						
Technology Competencies	610	620	621	608	603	601	Total
1. Demonstrates ability to operate a computer system in order to successfully use software.	X	X	X		X	X	5
2. Evaluates & uses computer & related technologies to support the instructional process.	X	X	X				3
3. Applies instructional principles, research, & appropriate assessment practices to the use of computers & related technologies.	X	X	X				3

4. Explores, evaluates & uses computer/technology-based materials, including applications, educational software, & associated documentation	X	X	X				3
5. Demonstrates knowledge of uses of computers for problem solving, data collection, information management, communications, presentations & decision making.	X	X	X		X	X	5
6. Designs & develops student learning activities that integrate computing & technology for a variety of student grouping strategies & for diverse student populations.	X	X	X	X			4
7. Evaluates, selects, & integrates computer and technology-based instruction into the curriculum of one's subject area(s) & grade levels.	X	X	X	X			4
8. Demonstrates knowledge of the uses of multimedia, hyper-media & telecommunications to support instruction	X	X	X				3
9. Demonstrates skill using productivity tools for professional & personal use, including word processing, databases, spreadsheets, & print & graphics utilities	X	X	X			X	4

10. Demonstrates knowledge of equity, ethical, legal, & human issues of computing & technology use as they relate to society and models appropriate behaviors.	X	X	X				3
11. Identifies resources for staying current in applications of computing & related technologies in education.	X	X	X	X	X		5
12. Uses computer-based technologies to access information to enhance personal & professional productivity	X	X	X	X	X	X	6
13. Applies computers & related technologies to facilitate emerging roles of the learner and the educator.	X	X	X	X			4
TOTAL	13	13	13	5	4	4	

For spring, 1999, responses were received for five of the eight courses taught. The Course Integration Matrix had to be modified to reflect the changes in the third edition of the ISTE *Curriculum Guidelines* (1998). The original thirteen standards now are consolidated into three groupings: (1) Basic Computer/Technology Operations & Concepts; (2) Personal & Professional Use of Technology; and (3) Application of Technology in Instruction. Table 7 shows the number of competencies per course.

Table 7

Spring 1999 Graduate Education Courses Ranked by Inclusion of Technology Competencies

Course	Number of competencies covered (of 3)
Integrating Curriculum 609	3
Methods of Instruction 636	3
Analysis of Teaching 601	2
Philosophy of Education 605	2
Instructional Strategies 611	2
Educational Research 603	Not available
Inclusion Techniques 631	Not available
Teacher as Leader 640	Not available

Note. The three competency groups are from the ISTE Foundations Standards (1998).

While both faculty and students reported inclusion of Basic Computer/Technology Operations and Concepts (Competency A) and Personal and Professional Use of Technology (Competency B), the Application of Technology in Instruction (Competency C) is included in less than half of the courses for which statistics were reported. Table 8 shows the specific competencies included in each course for spring 1999.

Table 8

ISTE Competencies Included in Spring 1999 Courses

	Course					
Technology competencies	601	605	609	611	636	Total
A. **Basic Computer/Technology Operations & Concepts** Students use computer systems to run software; to access, generate and manipulate data; and to publish results. They also evaluate performance of hardware and software and apply basic troubleshooting strategies as needed.	X	X	X	X	X	5
B. Personal & Professional Use of Technology Students apply tools for their own professional growth and productivity. They use technology in communicating, conducting research, and solving problems. In addition, they plan and participate in activities that encourage lifelong learning and will promote equitable and legal use of computer/technology resources.	X	X	X	X	X	5
C. **Application of Technology in Instruction** Students apply computers and related technologies to support instruction in designated grade level and subject areas. They plan and deliver instructional units that integrate a variety of software, applications and learning tools. Lessons developed reflect effective grouping and assessment strategies for diverse populations.			X		X	2

Outcome 11. At least one of three full-time faculty and three of nine part-time faculty will document that they are modeling effective technology use for students in their courses.

This outcome was met.

All three full-time faculty have incorporated technology into their courses. Four of five adjunct faculty are using technology in their courses. While technology is being used in a majority of the courses, the use is not coordinated or linked to any competency standards. In addition, it should be noted that the use of technology in the courses is mainly a result of factors outside of the practicum.

Outcome 12. The number of professional development workshops on teaching with technology offered for graduate education faculty (both full- and part-time) will increase to at least one workshop per semester.

This outcome was not met.

No professional development workshops were offered for graduate education faculty.

Outcome 13. The number of full- and part-time graduate education faculty using electronic portfolios for classroom instruction and professional development will increase from zero to at least four.

This outcome was not met.

None of the graduate education faculty have developed their own electronic portfolios. As of the completion of the practicum (May 1999), none of the Education faculty, except for the writer, had personal and/or course web pages on the university server.

Unanticipated Outcomes

One of the unanticipated outcomes was the development of a profile of student Internet skills. The self-assessment survey, administered to all incoming Graduate Education students, provided data on student Internet skills, as well as availability and use of personal and/or university computer resources (see Appendixes A and B). The survey was administered from fall 1997, when the program officially began, until June 1999. The format of the survey was revised for the beginning of fall semester, 1998. Tables 9, 10, and 11 provide the survey results for the practicum period (fall 1998 to summer 1999).

Table 9

Computer Resources Available to Incoming Graduate Education Students, 1998-1999

Computer Resources	Students (n=92)
Computer at home	69
Access to computer at work/elsewhere	53
Modem and dial access	50
University Computer account	38

Table 10

Use of Information Technology Reported by Incoming Graduate Education Students, 1998-99

Information Technology Tools	Number of students reporting use (n=92)
Email	74
Internet search engines	70
ERIC education database	34

University library web page	28
Bulletin boards/listservs	25
Chat sessions/online conferences	24

Table 11

Self-Assessment of Internet Skills by Incoming Graduate Education Students, 1998-99

Competency	M (n=92)
Internet Searching	4.4
Email	3.5
Internet resource citation	2.8
Internet evaluation criteria	2.8
ERIC searching	2.7
Multimedia/hypermedia	2.7
Ethical/legal/social aspects	2.6
Internet in teaching	2.0
Web page creation	1.6
Electronic portfolio creation	1.3

Note. The mean was calculated from a scale of 1 to 5 (lowest to highest).

All three students enrolled in the MED 621 course indicated in the Self-Assessment of Internet Skills, administered at the beginning of the course, that they used email daily. They all owned a computer with a modem. Only one student had a university computer account. The areas that received the lowest scores in the self-assessment were using Internet resources for teaching, creating web pages, and creating electronic

portfolios (see Tables 12, 13, and 14 for a summary of the self-assessment survey results). This matches the profile of the graduate education students as a whole.

Table 12

Computer Resources Available to Students in Web-based Course, Fall 1998

Computer Resources	Students (n=3)
Computer at home	3
Access to computer at work/elsewhere	3
Modem and dial access	3
University Computer account	1

Table 13

Use of Information Technology Reported by Students in Web-based Course, Fall 1998

Information Technology Tools	Number of students reporting use (n=3)
Email	3
Internet search engines	2
ERIC education database	2
University library web page	2
Bulletin boards/listservs	2
Chat sessions/online conferences	2

Table 14

Self-Assessment of Internet Skills by Students in Web-based Course, Fall 1998

Competency	M (n=3)
Email	5
Internet Searching	3.6
Ethical/legal/social aspects	3.3
ERIC searching	3
Multimedia/hypermedia	2.6
Internet resource citation	2.6
Internet evaluation criteria	2.3
Internet in teaching	2.0
Web page creation	1
Electronic portfolio creation	1

Note. The mean was calculated from a scale of 1 to 5 (lowest to highest).

While the original outcomes did not include developing a web-based course, another unanticipated outcome was the transformation of the course from a traditional classroom-based format into one delivered over the Internet with minimal face-to-face meetings (see Appendix H for syllabus and course modules). This occurred because of the low enrollment in the course. With only four students registered, the normal options would be to cancel the course or offer it as an independent study. The writer proposed the alternative of a Web-based course with several face-to-face meetings. After approval by the department head and the dean, this was presented to the students at the first class

meeting, and they enthusiastically agreed. Students in the MED 621 course met five times during the sixteen-week course. Students indicated to the instructor that they preferred this format. While other courses in the university use Web-based materials, this was the first one to be offered in the virtual classroom modality.

Providing professional development for inservice teachers was a third unanticipated outcome. Because of the low enrollment in the MED 621 graduate course, the population impacted by the practicum needed to be expanded. Therefore, the writer contacted the Superintendent of Schools for the Catholic Diocese to propose an Internet skills workshop series for inservice teachers. The Catholic schools, unlike the metropolitan public schools, have minimal internal resources for providing technology training and support.

The first workshop was offered on April 30, 1999, for 17 teachers from 11 schools. The teachers were chosen by the Superintendent to participate on the basis of what they could contribute to their individual schools. Some of the teachers were already technology leaders in their schools, while others had little or no experience or skills. The workshop was designed as an overview of a variety of information technologies (see Appendix J for the workshop agenda and Web page).

The teachers completed a self -assessment of Internet skills one month prior to the workshop (see Appendix M). This survey was the same as the one completed by the graduate education students, with slight modifications for the different population. The survey results indicated a broad range of competencies and experience. Fourteen of seventeen teachers have a computer at home. Sixteen of the teachers said they had access to a computer at school.

The most commonly used information technology tools were email and Internet search engines, followed by university or public library web pages. Less than half of the participants had used the ERIC education research database, chat sessions/online conferences, or bulletin boards/listservs. They rated their skills as less than average for ERIC searching, using Internet resources for teaching, evaluating Internet resources, citing Internet resources, creating Web pages, and creating electronic portfolios. Fifteen of the seventeen teachers responded that they had not created a Web page. None of the teachers had any experience with electronic portfolios (see Tables 15, 16, and 17 for the reported responses).

Table 15

Computer Resources Available to Diocese Teachers

Computer Resources	Students (n=17)
Access to computer at work/elsewhere	16
Computer at home	14
Modem and dial access	13
Computer account at school	10

Table 16

Use of Information Technology Reported by Diocese Teachers

Information Technology Tools	Number of students reporting use (n=17)
Email	15
Internet search engines	12
University library web page	9

ERIC education database	5
Chat sessions/online conferences	5
Bulletin boards/listservs	2

Table 17

Self-Assessment of Internet Skills by Diocese Teachers

Competency	M
Email	3.3
Internet Searching	3.25
Multimedia/hypermedia	2.4
Ethical/legal/social aspects	2.25
ERIC searching	2.0
Internet in teaching	2.0
Internet evaluation criteria	1.9
Internet resource citation	1.6
Web page creation	1.3
Electronic portfolio creation	1.0

Note. The mean was calculated from a scale of 1 to 5 (lowest to highest).

At the end of the workshop, the participants completed a Workshop Assessment that addressed skills and comfort level with various information technologies (see Appendix N). In general, the teachers felt that the workshop provided them with information and skills they would use in their jobs. After the workshop, participants

indicated an increase in their confidence level and their expressed ability to search, evaluate, and use Internet resources, as shown in Figure 1.

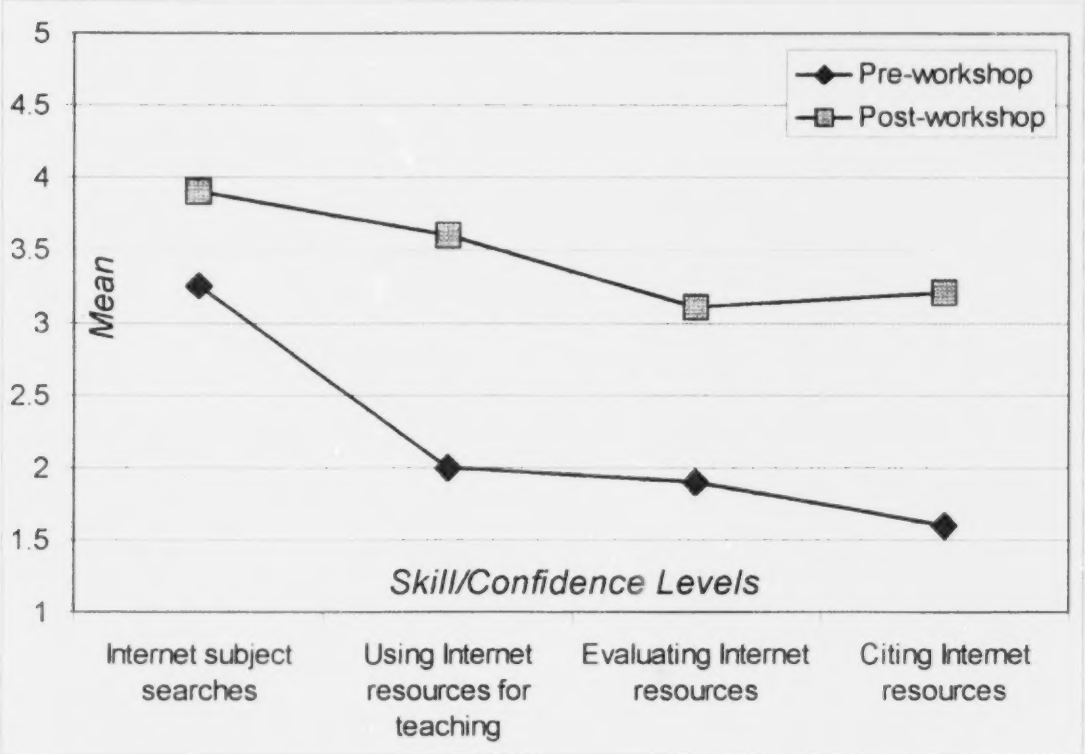

Figure 1. Comparison of mean response for Catholic Diocese teachers (n=17) on pre-workshop and post-workshop assessment of skill and confidence levels measured on a scale of 1 to 5 (beginner to expert).

Discussion

The goal of the practicum was for students in the graduate education program to develop and demonstrate specified information technology competencies. While the expected outcomes dealing with student technology competencies were not met due to low enrollment in the Internet for Instruction course, the students who completed the course achieved the goal of developing and demonstrating the technology competencies.

The data from the Self-Assessment of Internet Skills survey (see Appendixes A and B) provided a profile of student competencies at the beginning of the graduate program. This profile presents useful indicators for curriculum development and highlights the information technology foundation skills that should be provided at the beginning of the program, as well as the technology skills that could be addressed by designated courses.

To insure that information and communication technologies can be effectively included in courses, students need to have prior skills or training. The self-assessment data indicates that while 71% have a computer at home, only 51% have a modem and dial-access and 44% have a university computer account. This suggests that the orientation for incoming graduate education students should include providing a university computer account and insuring that students have adequate technology and basic skills for communication and access. In addition, basic technology prerequisites should be established for any technology courses beyond the foundation level.

A common finding for the Internet skills profiles of the three groups included in the practicum (entering graduate students, the students in the MED621 course, and the inservice teachers) was that they all reported substantial experience with email and Internet searching. However, all three groups had little or no experience with the integration of technology into teaching. A study of teacher technology standards for twelve member states of the Southern Regional Education Board found that the most difficult standard concerned integrating technology into instruction (Burke, 1998). Teacher education programs must shift the focus from computer literacy to technological

competence (Lowther, Bassoppo-Moyo, & Morrison, 1997) if they are to produce students who can use technology as learning tool.

The integration and sequencing of technology in the graduate education curriculum can use the profile of student skills as a foundation. Using the course matrix to map technology inclusion in the graduate education program showed that technology is included in a majority of the courses. However, when looking at the specific competencies, those dealing with the application of technology to instruction are included in less than half of the courses for which data was reported. It is clear that this should be the real focus of the curriculum. Data from the Internet skills assessment and the course matrixes can be compared to other studies of entry skills and technology use in teacher education programs (Kirby & Schick, 1998; Persichitte, Tharp, & Caffarella, 1998).

Students' attainment of technology competencies is also hampered by the lack of a "well-planned sequence of courses and/or experiences" involving the use and application of technology in education, as recommended by the National Council for Accreditation of Teacher Education (NCATE) Unit Accreditation Guidelines (ISTE, 1998, p. 21). The list of technology competencies used by the writer for both the Internet course and for the course matrix were derived from the guidelines established by the International Society for Technology in Education as the information technology foundation skills that should be included in all teacher education programs. This provides a widely used framework for the Graduate Education Program to use in future analysis and sequencing of technology in the curriculum, as has been done in other teacher education programs (Beichner, 1993; Friske, Knezek, Taylor, Thomas, & Wiebe, 1996; Handler & Strudler, 1997; Kahn, 1997; Levin, 1996).

The use of portfolios is becoming more widespread in teacher education because it produces results on several levels (Herman & Morrell, 1999; Jacobsen & Mueller, 1998; Meyer & Tusin, 1999; Richards, 1998; Tancock & Ford, 1996). Students can develop and demonstrate technology competencies through interacting with the technology; they become skilled at self-evaluation; and they experience an authentic learning environment that they can recreate with their own students.

The use of the rubric by students and faculty to assess the portfolios in the Internet course proved to be valuable for clarifying the desired outcomes. Since the use of rubrics is not as prevalent in higher education as in K-12 settings, use of this assessment tool needs to be explored further. There are a variety of examples in the literature of effective rubrics for assessing technology competencies (Bellingham Public Schools, 1997; Burke, 1998; Johnson, 1998; McLaughlin & Vogt, 1996; Popham, 1997).

While portfolios are an effective tool for improving learning and there are many reports of the use of portfolios in individual courses, the real value of portfolios is seen when they are implemented at the program or campus-wide level. In a review of student portfolio programs at independent colleges, Garth notes that "a portfolio's power is in cumulative development, from multiple courses and out-of-class experiences..." (1997, p. 2). The use of the electronic portfolio was effective at the course level, but program-wide implementation proved to be beyond the scope of this practicum.

The real promise of the practicum is the future implementation of the electronic portfolio throughout the curriculum. Further work needs to be done by the faculty as a whole to provide the necessary foundation of skills and the incentives for students to continue to enhance their electronic portfolios in each subsequent course. The portfolio

will represent their continuing growth, not only in technology, but also in a range of teaching skills and knowledge that are woven through the entire curriculum. Students can use the technology as a tool to preserve and highlight their best work.

The transformation of the Internet for Instruction course into a Web-based format had positive implications for the writer, the students, and the university. The writer gained new skills in developing and delivering a Web-based course that can be applied to other courses. The course also provides an example of using national and state standards as a framework for the content. The students were pleased with the non-traditional format; the use of the electronic portfolio and the rubric provided an environment of authentic assessment based on the students' experience and interests. They used the technology tools they were studying to create a personally meaningful project.

The university now has a successful example of a course model that uses technology to facilitate virtual as well as face-to-face class interactions. Web-based instruction is becoming more and more common in higher education, but it is still a pioneer pedagogy that requires much more work in terms of instructional design, field testing, and assessment, as well as faculty development (Boettcher & Cartwright, 1997; Gnagni, 1998; Herman & Morrell, 1999; Jin & Willis, 1998; Khan, 1997; Tipton, Kovalik, & Shoffner, 1998). Transforming courses into a Web-based format will be a waste of time if there is no accompanying transformation of the roles of teacher and student and no overall support from the university for this new direction.

Even though it is clear that faculty must have the appropriate skills to be able to successfully incorporate technology in the teacher education program, the outcomes for faculty development were too ambitious for this practicum and should be considered as a

second or third stage of development. Faculty development needs can best be identified after determining the technology outcomes for the program and then charting the distribution of technology skills and applications throughout the sequence of courses.

While plans for development activities for the graduate education faculty were not realized, an unanticipated outcome of the practicum was the development of inservice training for the Catholic Diocese teachers. Based on workshop feedback and further analysis of teacher needs, this pilot training will serve as the foundation for a projected inservice series for the 1999-2000 school year. This series will address a need for professional development opportunities for the Catholic schoolteachers and also serves a university goal of community outreach.

The partnership with the Catholic schools can also provide data and insights concerning authentic use of technology in the schools and a comparison of preservice and inservice teacher skill levels that could improve the integration of technology into teacher education. The writer has also proposed an educational technology internship for graduate education students to participate in developing and delivering the inservice workshops. As part of the post-workshop assessment, nine of the seventeen teachers had indicated an interest in participating in a web-based workshop, so this alternative format can also be explored.

In summary, through the implementation of this practicum, students enrolled in the Web-based Internet for Instruction course were able to develop and demonstrate a range of information technology competencies. The students' electronic portfolios can be used to document continuing professional development and to serve as resources for teaching. The portfolios, the rubric, and the Web-based course format developed for the practicum

can be used as preliminary models for non-traditional student-centered instruction and assessment at the university. The preliminary use of the course matrix to track the inclusion of technology in the courses can be continued as a tool for curricular improvement. The transformation of the Web-based Internet for Instruction course into an inservice workshop for the Catholic Diocese teachers extended the impact of the practicum and illustrated the versatility and value of this non-traditional interactive format.

Recommendations

The preliminary results of this practicum suggest that profiles of student technology skills, course matrixes, and electronic portfolios can all be effective tools for improving teacher education programs. The following recommendations are presented for the writer's institution, but they can apply equally to other teacher education programs at the undergraduate and graduate levels.

The teacher education program should develop a plan for the integration of technology that is linked throughout the curriculum, based on desired outcomes, an analysis of student skills and experience, faculty capabilities, and professional standards and "best practice" models. Students will not be prepared to use technology as an integral part of teaching through one or two isolated courses.

Continuing use of the course matrix would be enhanced by increased interaction with individual faculty to determine needs and to establish consensus as a necessary foundation for technology incorporation at the program level.

Technology competency outcomes must be identified for the graduate education program. State and national standards are available as guidelines. In addition, "best

practice" models and direct experience with local schools can be used to define the outcomes.

Technology integration can start at a simple level. Email should be a basic tool for most, if not all, courses. While the majority of students have experience with email, teacher education programs should insure that students and faculty have the necessary access to computer resources and basic email skills, which would include attaching files and participating in a listserv.

Technology skills of all entering students should be assessed and compared with the technology outcomes to determine the pattern of technology infusion in the curriculum and to identify what additional support in the form of workshops, Web-based tutorials, or other methods might be needed in addition to the courses.

Professional development opportunities for both full-time and adjunct faculty must be provided so they can effectively and enthusiastically integrate technology into their courses and model appropriate use. Technology skill levels of faculty will have to be determined and compared with the technology outcomes to determine gaps where training is needed.

New paradigms for teaching and learning, such as electronic portfolios and Web-based instruction, should be explored and encouraged at both the program and the university level. Most importantly, as an outcome of the graduate education program, students must have the knowledge and experience to competently use technology in their teaching.

Dissemination

Plans for dissemination of the practicum results include several options at the institutional, community, and professional levels. A report will be presented to the Graduate Education Program director and faculty detailing the profile of student Internet skills and the course matrix mapping of technology inclusion in the curriculum. A proposal will be made to the University Information Technology Strategic Planning Committee, of which the writer is a member, that the course matrix model be used to determine current technology integration across the university curriculum. The writer will design a workshop on developing Web-based courses as part of the university's Information Technology workshop series for faculty. The Web-based Internet for Instruction course can be made available to a broader Internet audience through inclusion in Internet teaching sites such as the World Lecture Hall at the University of Texas at Austin.

WebCT will be used to transform the "Internet for Instruction" web-based course modules into a stand-alone self-paced Internet learning package that can be used by graduate education students and inservice teachers. WebCT provides the capability to track student usage, mount student web pages, send group or individual email, and conduct discussion forums. It is anticipated that WebCT can also be used by other faculty to develop Web-based modules.

An article will be submitted to one of the journals that focuses on teacher education or technology in education. Possible topics include the profile of student Internet skills and the development of Web-based instruction. An article and/or presentation on the use of portfolios will be developed for librarian colleagues involved in

information literacy instruction through the American Library Association's Association of College and Research Libraries. Teaching portfolios are beginning to be developed by librarians, but the use of portfolios with students for library instruction is not common. The use of rubrics in library instruction in higher education is also a new approach to be explored.

The inservice workshops on technology for teaching will be refined and expanded. A local foundation has expressed interest in funding partnerships between the Catholic schools and local higher education institutions. Extensive work is needed to identify the infrastructure and professional development required for successful and realistic integration of technology into teaching.

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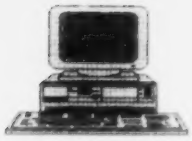
APPENDIX A

INTERNET SKILLS ASSESSMENT
1997-98



SELF-ASSESSMENT OF INTERNET SKILLS

Personal Internet Access

Do you:

1. Have a computer at home? ____ yes ____ no
   ____ PC or ____ Mac
2. Have a modem and use dial access? ____ yes ____ no
3. Have access to a computer at work or elsewhere? ____ yes ____ no
4. Have a CBU computer account? ____ yes ____ no
5. Have access to the Internet? ____ yes ____ no

Internet Skill Assessment

6. Please check all that you have used:

___ University Library	___ file transfer (FTP)
___ email	___ Internet search engines (e.g. Alta Vista, Infoseek)
___ chat sessions/online conferences	___ ERIC education research database
___ online library catalogs	___ other information/reference databases
___ bulletin boards, listservs	___ Web browser (e.g. Netscape)

Circle the number on a scale of 1-5 that best represents your skill level and experience:

7. How comfortable are you as a Web navigator using a browser such as Netscape or Microsoft Explorer?
   Not very 1 2 3 4 5 Very
8. Can you do subject searches on the Internet to find information you need?
   Never 1 2 3 4 5 Always
9. Do you know how to cite Internet resources in a research paper?
   Not at all 1 2 3 4 5 Easily
10. How would you rate your Internet skills?
    Novice 1 2 3 4 5 Expert

11. How often have you used Internet resources in a teaching situation?
    Never 1 2 3 4 5 Frequently

12. What is your level of skill in creating Web pages?
    Nonexistent 1 2 3 4 5 Excellent

8/27/97

APPENDIX B

SELF-ASSESSMENT OF INTERNET SKILLS
1998-99

SELF-ASSESSMENT OF INTERNET SKILLS

Do you:

1. Have a computer at home?

   ____ yes ____ no

   If yes, ____ PC or ____ Mac

2. Have a modem and use dial access?

   ____ yes ____ no

3. Have a CBU computer account?

   ____ yes ____ no

4. Have access to a computer at work or elsewhere?

   ____ yes ____ no

5. Have another Internet service provider?

   ____ yes ____ no

6. Please check all that you have used:

___ CBU Library Web Page

___ email

___ chat sessions/online conferences

___ bulletin boards/listservs

___ Internet search engines (e.g. Alta Vista, Infoseek)

___ ERIC education research database

Circle the number on a scale of 1-5 that best represents your skill level and experience:

7. How often do you use email for personal or professional communication?
   Never 1 2 3 4 5 Daily

8. Can you do subject searches on the Internet to find information you need?
   Never 1 2 3 4 5 Always

9. Are you successful in searching the ERIC database to find education research & resources on a topic?
   Not at all 1 2 3 4 5 Always

10. Do you know how to cite Internet resources in a research paper?
    Not at all 1 2 3 4 5 Easily

11. Can you list specific criteria you would use to evaluate whether Internet resources are valid and relevant for your purposes?
    Not at all 1 2 3 4 5 Easily

12. How would you rate your skills in using multimedia and hypermedia?
    Novice 1 2 3 4 5 Expert

13. Can you readily name one ethical, one legal, and one social implication of technology use in education?
    Not at all 1 2 3 4 5 Easily

14. How often have you used Internet resources in a teaching situation?
    Never 1 2 3 4 5 Frequently

15. What is your level of skill in creating Web pages?
    Nonexistent 1 2 3 4 5 Excellent

16. What is your experience with creating an electronic portfolio?
    Novice 1 2 3 4 5 Expert

APPENDIX C

ELECTRONIC PORTFOLIO RUBRIC

ELECTRONIC PORTFOLIO RUBRIC

For: _____ Total Score: _____

Reviewer: _____ Date: _____

Competency	3 Exemplary (Advanced knowledge)	2 Proficient (Functional knowledge)	1 Novice (Basic knowledge)
CONTENT Score ___	• Clear statement of purpose or evidence of central theme; all parts of the page relate back to this purpose or theme • Information is relevant and useful for the intended audience	• Purpose stated or theme clear; not all parts of the page may be relevant • Information is generally relevant and useful for the intended audience	• Purpose either not stated or unclear and/or not related to contents of the page • Information not relevant for intended audience or marginally useful
LAYOUT Score ___	• Attractive use of horizontal and vertical white space • An appropriate number of font sizes are used and they are suited to the purpose and enhance readability • One or more colors are used effectively for text and/or background	• Use of space is generally attractive • More than one font size is used, and most of the time adds to the design. • At least one color is used for text or background	• The overall appearance is too busy and not well-spaced • Too many or too few font sizes are used and/or they do not enhance the message • No colors are used, or if they are, they do not add to the appeal of the page
GRAPHICS Score ___	• Images are used to enhance the design of the page; images of the appropriate size and have been edited as necessary • Animation and sound effects, if used, are related to the message and overall design.	• Images are used, but not all of them enhance the design or are related to the topic. • Animation and sound effects, if used, are not always related to the purpose and design.	• No graphics, animation or sound are used, or if they are, they are used inappropriately
USE OF TOOLS Score ___	• Can use Netscape Composer and/or HTML to go beyond basic web page creation	• Can use Netscape Composer to create basic web pages with text, graphics, & layout features	• Difficulty in using Netscape Composer and/or HTML to create a basic web page

NAVIGATION Score ___	• Links work correctly, both for internal & external • Links are clearly labeled • Paths for user are clear & logical • Contains a title page, with other pages linked to it	• Some internal and Web links are not active • Links are not always clearly labeled • Navigation paths are generally clear, but sometimes the user is uncertain about how to move around • Contains a title page &least two pages linked to it	• Many of the internal and Web links do not work • Links are not well labeled • Contains only a title page, with perhaps one additional page • Paths not always clear, so that the user may get lost

APPENDIX D

ATTITUDINAL SURVEY

Attitudinal Survey - MED 621, Fall 1998

Circle the number on a scale of 1-5 that best represents your attitude or feeling:

1. I prefer being assessed through my electronic portfolio rather than through mid-term and final exams.

   Not at all 1 2 3 4 5 Very definitely

2. The portfolio process allowed me to be involved in real-world teaching and learning experiences that would not have been possible with more traditional assignments.

   Not at all 1 2 3 4 5 Very definitely

3. The portfolio process is a better match for my learning style than traditional standardized tests and assignments.

   Not at all 1 2 3 4 5 Very definitely

4. The portfolio process made learning more personally meaningful than traditional course evaluation methods.

   Not at all 1 2 3 4 5 Very definitely

5. The portfolio process has helped to develop my ability to evaluate my own work.

   Not at all 1 2 3 4 5 Very definitely

6. The portfolio process has helped me to develop my technology skills.

   Not at all 1 2 3 4 5 Very definitely

Please write any comments you wish to add to express your feelings about the portfolio process:

APPENDIX E

COURSE MATRIX
FALL 1998

Course Matrix for Fall 1998

Technology competencies	Courses Reporting					
	601	603	608	610	620	621
1. Demonstrates ability to operate a computer system in order to successfully use software.						
2. Evaluates & uses computer & related technologies to support the instructional process.						
3. Applies instructional principles, research, & appropriate assessment practices to the use of computers & related technologies.						
4. Explores, evaluates & uses computer/technology-based materials, including applications, educational software, & associated documentation						
5. Demonstrates knowledge of uses of computers for problem solving, data collection, information management, communications, presentations & decision making.						
6. Designs & develops student learning activities that integrate computing & technology for a variety of student grouping strategies & for diverse student populations.						
7. Evaluates, selects, & integrates computer and technology-based instruction into the curriculum of one's subject area(s) & grade levels.						
8. Demonstrates knowledge of the uses of multimedia, hyper-media & telecommunications to support instruction						
9. Demonstrates skill using productivity tools for professional & personal use, including word processing, databases, spreadsheets, & print & graphics utilities						

Course Matrix for Fall 1998 (page 2)

Technology competencies	Courses Reporting					
	601	603	608	610	620	621
10. Demonstrates knowledge of equity, ethical, legal, & human issues of computing & technology use as they relate to society and models appropriate behaviors.						
11. Identifies resources for staying current in applications of computing & related technologies in education.						
12. Uses computer-based technologies to access information to enhance personal & professional productivity						
13. Applies computers & related technologies to facilitate emerging roles of the learner and the educator.						

The course matrix was adapted from Handler & Strudler (1997). Permission to use was provided in the text of the article: "A blank Course Implementation Matrix is given on page 22. You can also find an electronic copy on ISTE's Web site. You can copy and modify this file to fit your needs" (p18).

APPENDIX F

COURSE MATRIX
SPRING 1999

Fundamental Concepts and Skills for
Applying Information Technology in Educational Settings
Spring 1999

Course No. _____ Course Name _____ Date _____

ISTE Foundation Standards International Society for Technology in Education, 1998	Some or all of the concepts and skills in Column 1 have been included in this course. Please check the answer that applies.	If yes, briefly note what concepts & skills have been developed & demonstrated. Describe examples of activities that incorporate technology.	If no, will they be included in the future or are they not applicable for this course?
D. **Basic Computer/Technology Operations & Concepts** Students use computer systems to run software; to access, generate and manipulate data; and to publish results. They also evaluate performance of hardware and software and apply basic troubleshooting strategies as needed.	Yes ___ No ___		
E. Personal & Professional Use of Technology Students apply tools for their own professional growth and productivity. They use technology in communicating, conducting research, and solving problems. In addition, they plan and participate in activities that encourage lifelong learning and will promote equitable and legal use of computer/technology resources.	Yes ___ No ___		
F. **Application of Technology in Instruction** Students apply computers and related technologies to support instruction in designated grade level and subject areas.	Yes ___ No ___		

APPENDIX G

PORTFOLIO RUBRIC

Portfolio Rubric

Technology competencies	1. Inadequate	2. Basic	3. Proficient	4. Exceptional
4. Demonstrates ability to operate a computer system in order to successfully use software.				
5. Evaluates & uses computer & related technologies to support the instructional process.				
6. Applies instructional principles, research, & appropriate assessment practices to the use of computers & related technologies.				
4. Explores, evaluates & uses computer/technology-based materials, including applications, educational software, & associated documentation				
5. Demonstrates knowledge of uses of computers for problem solving, data collection, information management, communications, presentations & decision making.				
1. Designs & develops student learning activities that integrate computing & technology for a variety of student grouping strategies & for diverse student populations.				
7. Evaluates, selects, & integrates computer and technology-based instruction into the curriculum of one's subject area(s) & grade levels				

Technology competencies	1. Inadequate	2. Basic	3. Proficient	4. Exceptional
10. Demonstrates knowledge of the uses of multimedia, hyper-media & telecommunications to support instruction				
9. Demonstrates skill using productivity tools for professional & personal use, including word processing, databases, spreadsheets, & print & graphics utilities				
10. Demonstrates knowledge of equity, ethical, legal, & human issues of computing & technology use as they relate to society and models appropriate behaviors.				
11. Identifies resources for staying current in applications of computing & related technologies in education.				
12. Uses computer-based technologies to access information to enhance personal & professional productivity				
13. Applies computers & related technologies to facilitate emerging roles of the learner and the educator.				

APPENDIX H

COURSE SYLLABUS AND MODULES FOR MED 621

GRADUATE EDUCATION PROGRAM

MED 621 COURSE PAGE
Using the Internet for Instruction
Fall 1998

INSTRUCTOR	COURSE DESCRIPTION
RATIONALE	OBJECTIVES
COURSE MATERIALS	COURSE POLICIES
SYLLABUS	STUDENT PAGES

☆INSTRUCTOR:

Sharon Mader, Associate Professor/Education Department and Library Director
Office: Plough Library
Office Hours: By appointment (Monday-Friday, 8am-4:30pm)
Telephone: 321-3430 Fax: 321-3219

email: smader@cbu.edu

☆COURSE DESCRIPTION:

Students will actively explore the capabilities of the Internet for instruction and professional development and will develop technology competencies for using computer-mediated communication tools (such as email, chat sessions, and discussion groups), searching the Internet and evaluating information resources, and creating a web page which can serve as an electronic portfolio.

☆RATIONALE:

As the twenty-first century approaches, technology is becoming an essential partner for teachers who want to create a new learning environment. This course will help to provide the foundation for integrating emerging technologies into the curriculum and envisioning new paths for teaching and learning. The CBU Graduate Education Program aims to produce teachers who lead, and technology will be one of their most powerful tools.

☆OBJECTIVES:

1. **Students will be familiar with computer-mediated communication tools and their uses in the classroom and for professional development and communication.**

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2. **Students will understand the organization of the Web and can demonstrate basic Web navigation skills.**
3. **Students will search for information on the Web and evaluate resources retrieved for usefulness and relevance.**
4. **Students will identify practical and effective uses of the Internet in the K-12 curriculum and create a specific Internet activity for a designated curriculum area.**
5. **Students will design and create a Web page that will serve as a resource for K-12 instruction and for professional development.**

☆**COURSE MATERIALS:**

Required text: Hixson, S. and Schrock, K. *Developing Web Pages for School and Classroom*. Westminster, CA: Teacher Created Materials, 1998.

Other readings as assigned, including Web resources.

☆COURSE POLICIES

Attendance Policy
Exams
Plagiarism

☆SYLLABUS

Course page URL: http://www.cbu.edu/~smader/educ621/syll98.html

SYLLABUS FOR MED621/FALL 1998
USING THE INTERNET FOR INSTRUCTION

MODULE 1 Aug. 26 Class meeting	Computer-mediated Communication Skills **Overview of Course/Getting Acquainted/Skills Assessment**
Sept. 2	**Computer-mediated Communication Skills (continued)**
MODULE 2 Sept. 9	Finding Useful Information: **Searching, Evaluating, & Citing Internet Resources**
Sept. 16	**Finding Useful Information: (continued)**
MODULE 3 Sept. 23 Class meeting	Exploring and Creating Internet Activities for the Classroom
MODULE 4 Sept. 30	Creating Basic Web Pages Using Netscape Composer, HTML, and Hyperstudio
Oct. 7	**Creating Basic Web Pages (continued)**
MODULE 5 Oct.14	The Electronic Portfolio: Design, Construction, and Evaluation **All assignments for Modules 1-3 must be given to the instructor by today.**
Oct. 21	**Fall Break - No class**
MODULE 6 Oct. 28 Class meeting	Communicating through the Web: Publishing Pages & Using the Web Board **Class session will cover Modules 4-6**
MODULE 7 Nov. 4	**Personal Portfolio Development and Evaluation (for rest of term)** **Creating Your Electronic Portfolio Template** **Web Board: Portfolio Sample Ideas**
Nov. 11 Class meeting	**Electronic Portfolios: Preliminary Evaluations** **Web Board: Copyright Issues**
Nov. 18	**Electronic Portfolios: Revisions and Improvements** **Web Board: Safety on the Net**
Nov. 25	**Electronic Portfolios: Provide Feedback and Continue to Refine** **Web Board: Internet Activities in the Classroom**
Dec. 2	**Electronic Portfolios: Complete Final Versions** **Web Board: Uses of Portfolios**
Dec. 9 Class meeting	**Electronic Portfolio Presentations & Evaluations**
Dec. 16	**Individual meetings with instructor**

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Module 1

Computer Mediated Communication Skills

Objective:

Students will be familiar with computer-mediated communication tools and their uses in the classroom and for professional development and communication.

For this module you will:

1. Understand the functions and uses of the Internet, the World Wide Web, and Internet browsers.
2. Obtain a university computer account and successfully log in to the university network.
3. Use email successfully to communicate with the instructor and fellow students.
4. Subscribe to a listserv in a subject area of interest and participate in the discussion.
5. Describe potential uses of email for collaborative projects in the K-12 classroom.

Basic Email Instructions
Discussion list resources
Email in the Classroom
Assignments

Module 2

FINDING USEFUL INFORMATION: SEARCH AND EVALUATION SKILLS

Objectives:

Students will find useful and relevant information on the Internet for classroom and professional use by:

1. Searching the Internet effectively	**Go to Search lesson**
2. Evaluating Internet resources	**Go to Evaluation lesson**
3. Citing electronic resources appropriately	**Go to Documentation lesson**

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Module 3

EXPLORING & CREATING INTERNET ACTIVITIES

Objectives:

- **Students will recognize categories of Internet activities for the classroom and they will create a sample Internet module.**
- **Students will understand the uses of an electronic portfolio for instruction and professional development.**
- **Students will explore the features of Hyperstudio as an example of a hypermedia authoring program, and they will develop a simple program with several cards.**

1. Internet activities for the classroom	**Go to Activities lesson**
2. Introduction to electronic portfolios	**Go to Portfolio lesson**
3. Hyperstudio tutorial	**Go to Hyperstudio lesson**

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Module 4

Creating Basic Web Pages: Tutorial

Objective:

Students will explore different ways to create basic Web pages, including Netscape Composer, HTML coding, and Hyperstudio authoring software.

Lessons:

1. Creating a basic Web page with Netscape Composer	**Go to Creating lesson**
2. Creating a basic Web page with HTML	**Go to HTML lesson**
3. Creating a basic Web page with Hyperstudio	**Go to Hyperstudio lesson**

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Module 5

The Electronic Portfolio: Design, Construction, & Evaluation

Objective:

Students will design, create, and evaluate a personal electronic portfolio in the form of a Web page that will serve as a resource for classroom instruction and for professional development.

Lessons:

1. Introduction to Portfolios	**Go to Portfolio lesson**
2. Designing the electronic portfolio	**Go to Designing lesson**
3. Constructing the electronic portfolio	**Go to Constructing lesson**
4. Evaluating using the portfolio rubric	**Go to Rubric lesson**
5. Sample Student Portfolios	**Sample 1** **Sample 2**

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Module 6

COMMUNICATING THROUGH THE WEB: PUBLISHING & WEB BOARDS

Objective:

Students will publish their Web pages to the university server to communicate their work to a broad audience, and they will engage in asynchronous discussion with their colleagues through the medium of the Web Board.

Lessons:

1. Publishing Web Pages	**Go to Publishing lesson**
2. Using the Web Board	**Go to Web Board lesson**

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APPENDIX I

ELECTRONIC PORTFOLIO WORKSHOP

Graduate Education Program
Electronic Portfolio Workshop

What is a portfolio?
Portfolio types and formats

Step 1: Developing the Working Portfolio

- Portfolio Guidelines
  Brainstorming on samples to match competencies (worksheet)
- Portfolio Log (worksheet)
  Collect and catalog at least 3 examples

Step 2: Selecting and Organizing Your Samples

- Audience and expectations (worksheet)
- Evaluation Rubric
- Selecting samples for final portfolio
- Organizing samples
  - According to specified criteria
  - By chronology
  - By level of complexity
  - By areas of knowledge or skill
  - By theme
  - A combination of the above

Step 3: Designing Your Portfolio

- Outlining and storyboarding your portfolio
  Contents:
  1. Introductory Material
     a. Title page
     b. Table of Contents
     c. Introduction (something about yourself, highlights of the portfolio, what you have learned about yourself as a result of the portfolio process)
     d. Portfolio Highlights Summary
  2. Body (collection of samples)
  3. Concluding Material (self-evaluation/reflection)
  a. Analyze your content
  b. Analyze your learning
  c. Analyze yourself
- Completing the samples (individual samples or groups of samples) with titles and descriptions (worksheet)

Step 4: Creating the Electronic Portfolio (e.g. as a Web page)

Creating Basic Web Pages:
http://www.cbu.edu/~smader/educ521/module4_composer_guide.html
Resources for Web Page Creation:
http://www.cbu.edu/~smader/educ521/module4_composer.html

Step 5: Presenting the Portfolio

- Use the portfolio outline or Portfolio Highlights summary to guide the presentation
- Show your best samples and indicate why they are important

APPENDIX J

INTERNET WORKSHOP FOR CATHOLIC DIOCESE TEACHERS

INTERNET WORKSHOP FOR TEACHERS
OF THE
CATHOLIC DIOCESE
April 30, 1999

WORKSHOP AGENDA

Introduction and Goals

Overview of Workshop Modules

Background and Vocabulary
- What is the Internet?
- What is the World Wide Web?
- Browser Navigation

Module 1: Computer-Mediated Communication
- Electronic mail
- Listservs
- Bulletin Boards
- Chat sessions

Module2: Finding Useful Information
- Searching
- Evaluating
- Citing

Break

Module 3: Exploring and Creating Internet Activities for the Classroom

Module 5: Safe Surfing and Acceptable Use Policies

Module 4: Using the WebBoard to Create a Teacher Network

Wrap-up
- Preview of Module 6
- Questions
- Workshop assessment

INTERNET WORKSHOP FOR
CATHOLIC DIOCESE TEACHERS

MODULE 1	**Computer-mediated Communication Skills**
MODULE 2	**Finding Useful Information: Searching, Evaluating, & Citing Internet Resources**
MODULE 3	**Exploring and Creating Internet Activities for the Classroom**
MODULE 4	**Diocese Teacher Network: Using the Web Board**
MODULE 5	**Safe Surfing and Acceptable Use Policies**
MODULE 6	**Creating Web Pages**
MODULE 7	**Resources for Further Learning**

This Web page can be found at:

http://www.cbu.edu/~smader/Diocese/index.html

APPENDIX K

ASSIGNMENT CHECKLIST FOR MED 621

MED621: ASSIGNMENT CHECKLIST

UNIT	ASSIGNMENT	DUE DATE	COMPLETED
Module 1	Readings E-mail introduction message Listserv subscription	9-2-98	
Module 2, Lesson 1	Subject & keyword Web searching Reflection on preferred search tool	9-23-98	
Module 2, Lesson 2	Web Site Evaluations Reflection on web searching	9-23-98	
Module 2, Lesson 3	Cite Internet Resources Reflection on reasons for documentation	9-23-98	
Module 3	Mini-lesson plan for an Internet classroom activity	10-7-98	
Module 4	Create 3 simple web pages using 1) HTML coding, 2) Hyperstudio tutorial, and 3)Netscape Composer Reflection on experience of creating web pages with different tools	10-28-98	
Module 5, Lesson 2	Readings Identify portfolio samples	11-4-98	
Module 5, Lesson 3	Readings Create portfolio front page	11-4-98	
Module 6	Use the WebBoard	11-4-98	
Module 7	Present electronic portfolio	12-9-98	

APPENDIX L

SELF-ASSESSMENT OF INTERNET SKILLS FOR DIOCESE TEACHERS

SELF-ASSESSMENT OF INTERNET SKILLS FOR DIOCESE TEACHERS

	YES	NO
1. Do you have a computer at home?		
If yes, PC?		
If yes, Mac?		
2. Do you have a modem and use dial access?		
3. Do you have a computer account at school?		
4. Do you have access to a computer at work or school?		
5. Do you have another Internet service provider (e.g. AOL)?		

6. Please check all that you have used:

___ University or public library web pages

___ Bulletin boards/listservs

___ Email

___ Internet search engines (e.g. Alta Vista, Infoseek)

___ Chat sessions/online conferences

___ ERIC education research database

Circle the number on a scale of 1-5 that best represents your skill level and experience:

7. How often do you use email for personal or professional communication?
   Never 1 2 3 4 5 Daily

8. Can you do subject searches on the Internet to find information you need?
   Never 1 2 3 4 5 Always

9. Are you successful in searching the ERIC database to find education research & resources on a topic?
   Not at all 1 2 3 4 5 Always

10. Do you know how to cite Internet resources in a research paper?
    Not at all 1 2 3 4 5 Easily

11. Can you list specific criteria you would use to evaluate whether Internet resources are valid and relevant for your purposes?
    Not at all 1 2 3 4 5 Easily

12. How would you rate your skills in using multimedia and hypermedia?
    Novice 1 2 3 4 5 Expert

13. Can you readily name one ethical, one legal, and one social implication of technology use in education?
    Not at all 1 2 3 4 5 Easily

14. How often have you used Internet resources in a teaching situation?
    Never 1 2 3 4 5 Frequently

15. What is your level of skill in creating Web pages?
    Nonexistent 1 2 3 4 5 Excellent

16. What is your experience with creating an electronic portfolio?
    Novice 1 2 3 4 5 Expert

APPENDIX M

WORKSHOP ASSESSMENT
FOR DIOCESE TEACHERS

Workshop Assessment for Diocese Teachers
April 30, 1999

Please circle the one answer that best represents your attitude.

1. Following this workshop, I will subscribe to a listserv on a professional topic that interests me.

No, definitely not subscribe	Possibly	Yes	Yes, definitely	Already
1	2	3	4	5

2. Following this workshop, I feel more confident about doing subject searches on the Internet.

No, definitely not confident	Possibly	Yes	Yes, definitely	Already feel
1	2	3	4	5

3. Following this workshop, I know how to cite Internet resources for a paper or other purpose.

No, definitely not how	Possibly	Yes	Yes, definitely	Already knew
1	2	3	4	5

4. Following this workshop, I can list specific criteria for evaluating Internet resources.

No, definitely not criteria	Possibly	Yes	Yes, definitely	Already knew
1	2	3	4	5

5. Following this workshop, I am more comfortable about using Internet resources for teaching.

No, definitely not them	Possibly	Yes	Yes, definitely	Already use
1	2	3	4	5

6. Following this workshop, I am likely to use the WebBoard for communicating with colleagues.

No, definitely not one	Possibly	Yes	Yes, definitely	Already use
1	2	3	4	5

7. This workshop provided me with information and skills that I will use in my job.

No, definitely not	Possibly	Yes	Yes, definitely	Already use
1	2	3	4	5

8. I would be interested in doing a workshop in a Web-based format.

No, definitely not	Possibly	Yes	Yes, definitely	Already use
1	2	3	4	5

What topics would you like to see included in future workshops?

What was the most important thing you learned today?

Please provide other comments on workshop content, presentation, or any other aspects that were strengths or weaknesses: